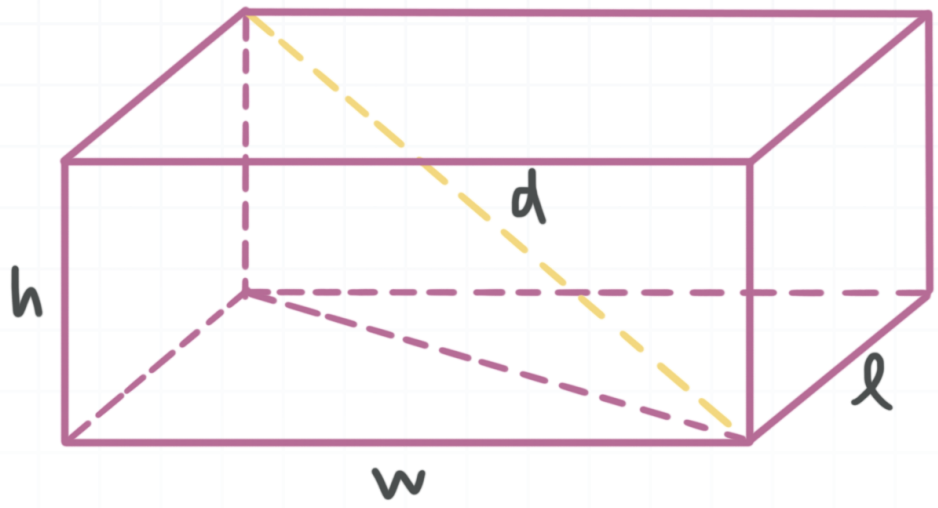
Diagonal of a right rectangular prism

The diagonal of a right rectangular prism goes from one corner of the prism, across the interior volume, all the way to the opposite corner of the prism.



You can find the length of a diagonal of a right rectangular prism using

$$d = \sqrt{l^2 + w^2 + h^2}$$

where d is the length of the diagonal, and l, w, and h are the length, width, and height, respectively. Let's start by working through an example.

Example

What is the length of the diagonal of the right rectangular prism?

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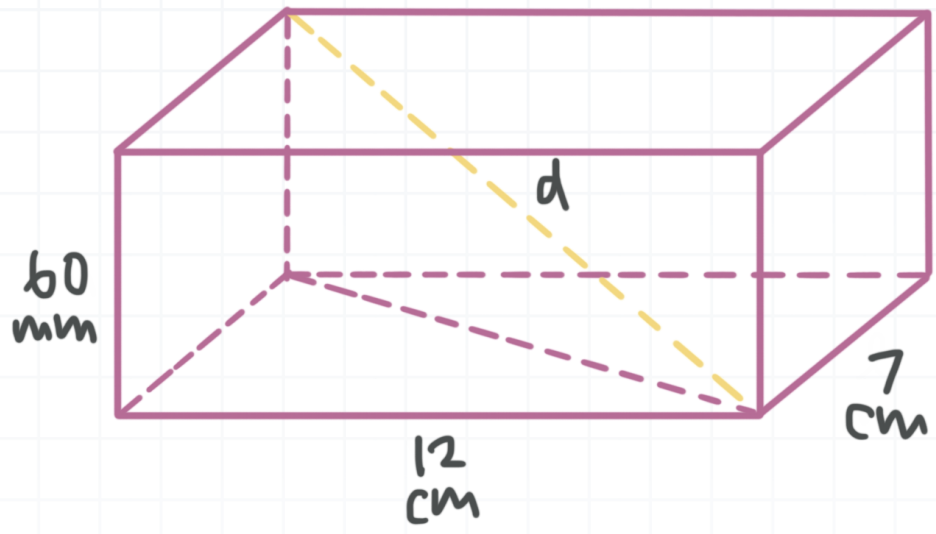
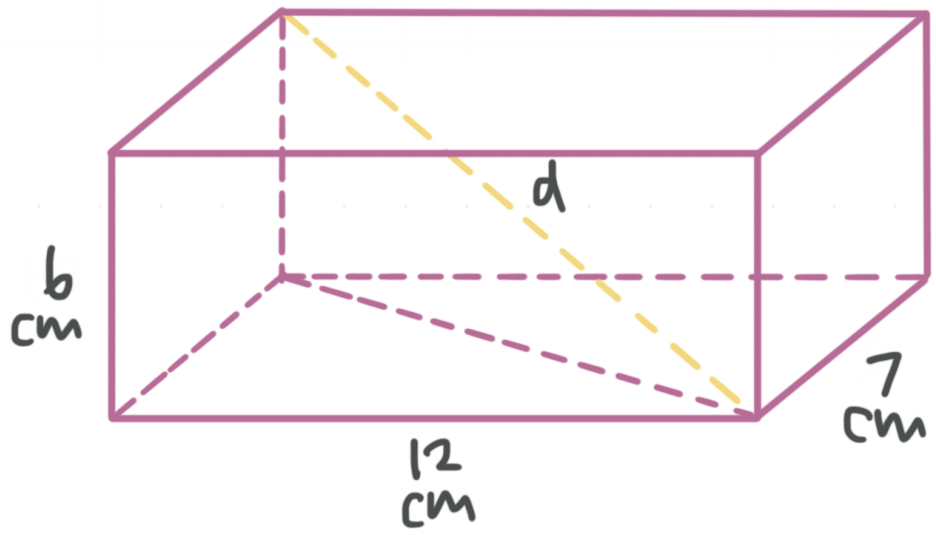


Not all of the dimensions here are the same. Change 60 mm to centimeters first.

$$60 \text{ mm} = 6 \text{ cm}$$

Then the dimensions are



Plugging these into the formula for the diagonal, we get

$$d = \sqrt{l^2 + w^2 + h^2}$$

$$d = \sqrt{7^2 + 12^2 + 6^2}$$

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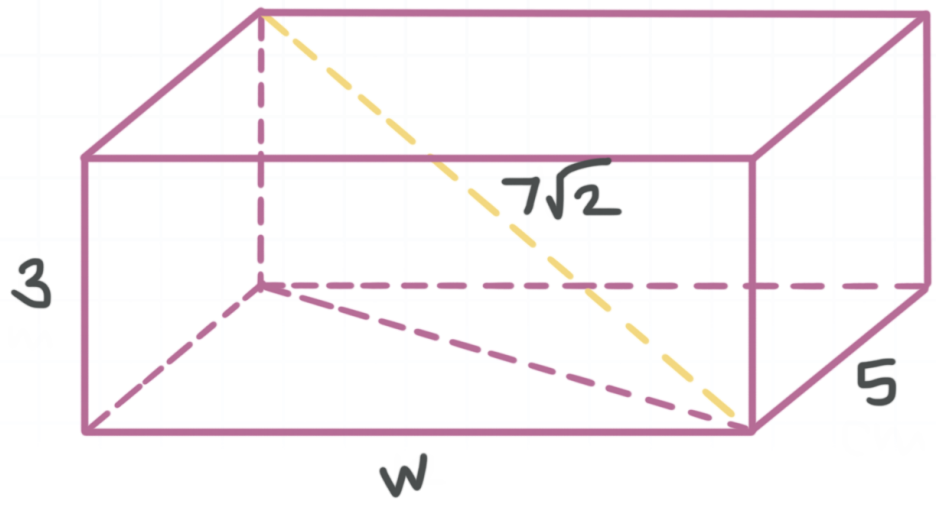
$$d = \sqrt{49 + 144 + 36}$$

$$d = \sqrt{229} \text{ cm}$$

Let's try another one.

Example

Find the width of the right rectangular prism.



We just need to plug the dimensions we've been given into the formula for the diagonal.

$$d = \sqrt{l^2 + w^2 + h^2}$$

$$7\sqrt{2} = \sqrt{5^2 + w^2 + 3^2}$$

Manipulate the equation to solve for w.

$$(49)(2) = 5^2 + w^2 + 3^2$$

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$$98 = 25 + w^2 + 9$$

$$98 = 34 + w^2$$

$$64 = w^2$$

$$8 = w$$

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